

What is claimed is:

1. A cooling system for an electric motor of a vehicle, comprising:

an electric motor which drives the vehicle;

5 a reduction gear which adjusts a driving force of an output shaft of the electric motor and transmits the driving force to a drive shaft; and

an in-shaft refrigerant passage provided in a shaft of the reduction gear and the output shaft of the electric motor,

10 wherein a refrigerant which has passed through the in-shaft refrigerant passage is collected outside a motor case housing the electric motor, and is circulated.

2. A cooling system for an electric motor of a vehicle according to claim 1, further comprising:

15 a rotation detector chamber which houses a rotation detector for detecting rotations of the output shaft of the electric motor, the rotation detector chamber being provided on an end portion of the output shaft of the electric motor separately from the motor case; and

20 an outside refrigerant passage which allows an inside of the rotation detector chamber and a refrigerant feedback passage in a reduction gear case housing the reduction gear to communicate with each other outside the motor case,

25 wherein the refrigerant which has passed through the in-shaft refrigerant passage is allowed to flow into the

rotation detector chamber and is circulated to the refrigerant feedback passage through the outside refrigerant passage.

3. A cooling system for an electric motor of a vehicle
5 according to claim 2, further comprising:

a metal foreign object trap which induces a metal foreign object in the refrigerant into a pocket by a magnetic force of stator coils of the electric motor, the metal foreign object trap being provided to the outside refrigerant passage.

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4. A cooling system for an electric motor of a vehicle according to claim 3,

wherein an auxiliary coil is provided for the metal foreign object trap, and the magnetic force inducing the metal
15 foreign object into the pocket is augmented by controlling a current applied to the auxiliary coil.

5. A cooling system for an electric motor of a vehicle according to claim 4,

20 wherein a current phase of the auxiliary coil is determined based on a phase of a stator coil closest to the auxiliary coil.

6. A cooling system for an electric motor of a vehicle
25 according to claim 4,

wherein a current value of the auxiliary coil is

determined in accordance with a flow amount of the refrigerant flowing through the outside refrigerant passage.

7. A cooling system for an electric motor of a vehicle
5 according to claim 3,

wherein the refrigerant feedback passage includes a refrigerant reservoir and a pump which pumps the refrigerant in the refrigerant reservoir, and

the metal foreign object trap is provided in a vicinity
10 of the refrigerant reservoir.

8. A cooling system for an electric motor of a vehicle according to claim 4,

wherein the refrigerant feedback passage includes a
15 refrigerant reservoir and a pump which pumps the refrigerant in the refrigerant reservoir, and

the metal foreign object trap is provided in a vicinity of the refrigerant reservoir, and when a temperature of the refrigerant is low, only the auxiliary coil is energized in
20 order to heat up the refrigerant by heat of the auxiliary coil.

9. A cooling system for an electric motor of a vehicle according to claim 3,

wherein valves are interposed in the outside refrigerant
25 passage on both sides of the metal foreign object trap, and

the metal foreign object trap is made detachable from

the outside refrigerant passage.

10. A cooling system for an electric motor of a vehicle according to claim 2,

5 wherein at least part of the outside refrigerant passage is formed of a transparent material for visually observing the refrigerant inside.

11. A cooling system for an electric motor of a vehicle according to claim 1,

 wherein the in-shaft refrigerant passage has a function in which the refrigerant is pressured to be sent in an axial direction.

12. A cooling system for an electric motor of a vehicle according to claim 1,

 wherein the in-shaft refrigerant passage has a shape in which heat exchange occurs between the output shaft and the refrigerant.

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13. A cooling system for an electric motor of a vehicle according to claim 1,

 wherein spiral grooves are formed on an inner wall of the in-shaft refrigerant passage.

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